

**PART 1 – MARINE WATERS**  
**DRAFT 2006 INTEGRATED REPORT OF ASSESSED WATERS IN**  
**HAWAII**  
**PREPARED UNDER CLEAN WATER ACT §303(d) AND §305(b)**



Prepared by The Hawaii State Department of Health  
Clean Water Branch

## **ACKNOWLEDGEMENTS**

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Steven J. Dollar, PhD., Marine Research Consultants.

Hanalei Watershed Hui, Kauai

## EXECUTIVE SUMMARY

Overall, the quality of the waters of the State is very good. The majority of the coastal waters and upland surface waters are in good condition. The overall quality of Hawaii's groundwater is generally considered excellent. The chemical contaminant concentrations that have been detected in public groundwater/drinking water sources are generally below state and federal drinking water standards.

The 2006 Integrated Report is the first effort by the Hawaii State Department of Health (HIDOH) to integrate both reporting requirements of the Clean Water Act (CWA) section (§) 305(b) and §303(d). This report is comprised of three sections, each with a particular focus. Section I focuses on coastal waters, and contains the actual 2006 Waterbody Assessment Decisions (Integrated 303(d) List/305(b) Report for Hawaii) (henceforth known as IR List) listing table for coastal and inland waters. Section II focuses on inland waters and deals with inland streams and other waters. Section III addresses the states' groundwater assessment.

The CWA §305(b) requires states to submit a list of assessed waters and determine if the quality of the water bodies are fulfilling their designated uses as specified in the state's surface water quality standards. Additionally, the CWA §106(e) requires State reporting on the status of their groundwater resources to Congress every two years in the biennial 305(b) report. The CWA §303(d) requires States to submit a list of Water Quality-Limited Segments, waters that do not meet state water quality standards, plus a priority ranking of listed waters, based on the severity of pollution and the uses of the waters.

The §303(d) list leads to action. Total Maximum Daily Loads (TMDLs) are pollution budgets to bring §303(d)-listed pollutant/water body combinations into compliance with water quality standards. Computation of TMDLs for all 303d listed pollutant water body combinations, prepared in accordance with the priority rankings, must follow EPA approval of each state's list.

Hawaii's 2004 §303(d) List plus data collected from State surface water bodies over the past six years constitute the information reviewed for this 2006 Integrated report. Decisions to list, de-list or not list a water body, for which data exist and have been reviewed, must be documented (40 CFR §130.7). The review of water quality requires a minimum amount data over a period of time, so extreme events of very short duration do not necessarily cause a water body to be listed. The periodic listing process allows Hawaii Department of Health (HIDOH) to list, de-list, or more clearly articulate or delineate the parameters for which the water bodies are listed.

HIDOH's 2006 303(d) List contains a total of 93 streams segments and 219 coastal areas. One stream was entirely de-listed and several modifications were made within listings. Seventeen new streams were listed. For coastal waters, 42 new water bodies were listed, 2 were de-listed, and 6 previously listed water bodies were listed for new pollutants. In total, there were 534 coastal water bodies, of which 270 (51%) had available data for assessment. The breakdown for the individual islands are: Kauai 38 (45%), Oahu 98 (54%), Molokai 38 (8%), Lanai 8 (44%), Maui 76 (61%), and Hawaii 47 (53%).

Within the 93 listed inland freshwater perennial streams, there were a total of 296 individual pollutant/water body combinations. The most common listing was turbidity with 101 instances

of exceedance. The next most common listings were Nitrite/Nitrates, Total Nitrogen, and Total Phosphorus with 75, 67, and 41 instances of exceedance, respectively. There were 5 instances of Dieldrin listings, 2 Chlordane, 2 Total Suspended Solids, and 1 listing for Metals/Lead.

Of the 219 listed coastal waters, 63 were due to high *Enterococcus* indicator bacteria test results. In general the department does not consider these waters to represent a threat to human health, despite the results, because in tropical waters, *Enterococcus* may result from animal waste or soils, instead of human sewage which the indicator bacteria was intended to signal. Recent studies presented at the recent 2006 BEACH Conference suggest that *Enterococcus* reproduces in biofilm found in drainage pipe, concrete channels and river rocks, and in beach sand. For these reasons, Hawaii uses a secondary indicator, *Clostridium perfringens* to determine if human fecal contamination is involved

Hawaii's bacterial water quality standard is only 7 colony forming units (CFU)/100mL, as compared to the national standard of 35 cfu/100mL. During rain events, *Enterococcus* levels in the coastal waters increase due to storm water runoff from streams and storm drains. For these reasons, HDOH intends to raise the Hawaii standard to 35 cfu/100mL to match the national standard. Nonetheless, when *Enterococcus* levels rise during non-storm related events, a sanitary survey is conducted to determine the cause of the rise.

Turbidity was the most common pollutant to trigger a coastal water listing with 204 occurrences. The HDOH thinks these are due to polluted runoff, and is focusing its polluted runoff control program on selected watersheds to make measurable improvements.

The 42 new coastal areas were listed for one or a combination of pollutants that include *Enterococcus*, total nitrogen, nitrate + nitrite, total phosphorus, turbidity, chlorophyll a, and ammonium nitrogen. Similar to the existing listings, turbidity was the most common pollutant to trigger a coastal water listing, with 21 occurrences.

The groundwater report presents aquifer specific assessments for groundwater resources in the State of Hawai'i for 2004 and 2005. The report shows that contamination continues to occur in Hawai'i. In most cases, once a groundwater source has been contaminated, it remains contaminated for many years. Groundwater can become contaminated through natural processes, but anthropogenic, or human induced, contamination poses more serious problems. Contaminants may come from herbicides, pesticides, industrial solvents, and other sources which are applied, spilled, or leaked into the ground. Groundwater contamination is a significant concern because nearly all of Hawai'i's drinking water comes from groundwater sources.

The overall quality of Hawai'i's groundwater is generally considered excellent. The chemical contaminant concentrations that have been detected in public groundwater/drinking water sources are generally below state and federal drinking water standards. The percentage of Hawai'i's population served by drinking water in compliance with State and Federal microbial and chemical standards called maximum contaminant levels (MCLs) was 99.1% in 2005. See attached Hawai'i State Department of Health Indicators of Environmental Quality for drinking water.

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## PART A. INTRODUCTION

This report is intended to satisfy the requirements for the Integrated Report (303(d), 305(b), 314). These reports have previously been separated into three final products, however, EPA's guidance for compiling the 2006 Integrated Report for 303(d)/305(b) <sup>1</sup> urges states to integrate their 303(d) Lists and 305(b) Reports to ensure that consistent methodologies are applied in the preparation of both documents. Section 314 is not applicable in Hawaii for the purposes of this report since there are no publicly owned, public access lakes which the State considers significant. The 305(b) report is "[t]he **National Water Quality Inventory Report to Congress** ... [and] is the primary vehicle for informing Congress and the public about general water quality conditions in the United States. This document characterizes our water quality, identifies widespread water quality problems of national significance, and describes various programs implemented to restore and protect our waters". <sup>2</sup> EPA recommends that states sort their surface waters into 5 Categories according to the following guidance:

- Category 1:** All designated uses are supported, no use is threatened;
- Category 2:** Available data and/or information indicate that some, but not all of the designated uses are supported.
- Category 3:** There is insufficient available data and/or information to make a use support determinations.
- Category 4:** Available data and/or information indicate that at least one designated use is not being supported or is threatened, but a TMDL is not needed.
  - 4a.** A TMDL to address a specific segment/pollutant combination has been approved or established by EPA.
  - 4b.** A use impairment caused by a pollutant is being addressed by the state through other pollution control requirements.
  - 4c.** A use is impaired, but the impairment is not caused by a pollutant.
- Category 5:** Available data and/or information indicate that at least one designated use is not being supported or is threatened, and a TMDL is needed.

The 303(d) List of Impaired Waters, identifies water bodies that are not expected to meet state water quality standards, even after application of technology-based effluent limitations. States are required to obtain and review all existing and readily available surface water quality data and related information to compare against the state's Water Quality Standards, and after applying listing criteria, determines the level of impairment for that water body. The list requirements apply to water bodies impaired by point and/or non-point sources of pollution and include a requirement for listing of those pollutants for which applicable water quality standards are exceeded.

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<sup>1</sup> Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act (July 29, 2005)

<sup>2</sup> EPA Monitoring and Assessing Water Quality (n.d.). Retrieved September 27 2006, from <http://www.epa.gov/305b/>

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The 2006 List of Water Quality-Limited Segments, plus a priority ranking of listed waters, based on the severity of pollution and the uses of the waters, must be submitted by HDOH to EPA for approval by April 1, 2006. Computation of Total Maximum Daily Loads (TMDLs) for all listed pollutant/water body combinations, prepared in accordance with the priority rankings, must follow EPA approval of each state's List within a reasonable period of time. The time frame for establishing TMDLs should be 8 to 13 years from the date of the original listing. For example, a water segment originally included on the 1998 section 303(d) list, and still identified on the 2006 submission as requiring a TMDL, should be addressed by 2011.

Hawaii's 2004 List plus data collected from these and other State water bodies over the past six years constitute the body of information reviewed for the 2006 Integrated Report. Decisions to list, de-list or not list a water body, for which data exist and have been reviewed, must be documented (40 CFR §130.7). The periodic listing process allows HDOH to list water bodies, which after recent sampling, show exceedance; de-list water bodies (from the 303(d) section), which do not, after further sampling show exceedance for listed parameters; and more clearly articulate the parameters for which previously listed water bodies should be listed. Additional information is also provided regarding attainment of known pollutants, pursuant to the 305(b) portion of the guidance as well.

HDOH's 2006 Integrated Report, 303(d) List of Impaired Waters contains a total of 93 stream segments and 218 coastal segments for which decisions of attainment or non-attainment reflect the water bodies status as impaired. One stream was entirely de-listed and there were many changes within the parameters of listed water bodies. Usually, HDOH reports the previous year totals plus any new additions to the list. However, this year HDOH has segregated the decision units to classify the waters into water body types as described in HAR §11-54-1. Therefore, direct comparison of decision units between the 2004 List and that presented in the 2006 Report is not practical. There were 17 new inland water segments, and 42 new coastal water bodies listed for 2006.



## **PART B. SCOPE OF WATERS IN THE INTEGRATED REPORT**

This report covers all waters of salinity more than 0.5 parts per thousand, which include estuary and coastal waters. Assessment units were modified for the 2006 cycle. For previous cycles, the assessment units were the sampling stations. The 2006 cycle maintains the sampling stations, but expands the geographic scope to include a larger water body area. The 2004 listings were referenced to ensure proper placement of previously listed areas. Water bodies were partitioned according to HAR §11-54 by type and then listings renewed accordingly. Please see methodology section, Part C.2. for details regarding decision units for attainment decisions.

## **PART C. SURFACE WATER MONITORING AND ASSESSMENT**

### **C.1. Monitoring Program**

This part of the water quality assessment report discusses the condition of the various water bodies (estuaries, coastal shorelines). The entire monitoring program is examined from strategies and procedures to data assessment. The majority of the information used in this section was gathered mainly from the Clean Water Branch.

#### **Monitoring Strategy Overview**

Two main types of surface water monitoring data are used in this report: bacteriological, and chemical. Bacteriological monitoring of the shoreline areas continues under the auspices of the BEACH program, and the guidance of a QAPP (newer version in final stages of approval). Shoreline and offshore chemistry monitoring have been curtailed including the quarterly samples in Kaneohe and Pokai Bays,

EPA's STORET databases are the repository of data and information collected by DOH. Water body assessments will utilize the most current data and information from these systems. The end-users of the database systems include not only government agencies but consultants, students and the general public.

As with other volunteer monitoring programs throughout the nation, the public sector contributions provide invaluable service not only to the communities but to government as well. In Hawaii, an example is the partnership with the Hanalei Watershed Hui and the DOH monitoring program. To a large extent the projects are currently part of the learning experience in which the participants hope to develop a model for other volunteer groups and communities elsewhere. It is hoped that future projects will involve other volunteer groups as well.

Collaboration between the Department of Health and other state and federal agencies, including private consulting firms, is another key component of the monitoring program. The permit requirements such as CWA §401 stipulate water quality monitoring by permit applicants. It provides a source of data from which the State's monitoring program also benefits. Currently, this data does not reside in the STORET system, although it is a possible future consideration. Water quality data generated by the permits result in greater Statewide coverage and comprehensive assessments at no increase in cost to the program. The coordination between

multiple agencies and permit applicants also provides for expediting the permit process through early plan reviews and dialogues in preconstruction meetings.

## **Networks and Programs**

### **Microbiological Sampling**

The purpose of the CWB microbiological sampling is to focus mainly on the shoreline waters throughout the state for the purpose of assuring the safety of the swimmers, surfers, divers and other recreational users of the near shore waters. This program serves two purposes, first it identifies those areas where there is a potential for health related risks associated with the recreational use of shoreline waters. Secondly, monitoring provides an ongoing baseline from which to establish trends in the future, and from which to determine if additional sample results show unusual or abnormal levels, (i.e., indicating possible contamination, such as a sewage leak).

As of December 2005, the CWB bacteriological monitoring program was sampling at approximately 79 stations (lesser or greater depending on rotational series) throughout the state (Kauai 8, Oahu 37, Maui 13 and Hawaii 21). The approximate 79 stations are among the 363 stations established throughout the state (Kauai 31, Oahu 177, Maui 70, and Hawaii 85), most of which are sampled on a rotational basis. The sites are monitored on a twice-weekly (core sites) or bi-weekly (rotational sites) basis.

Water samples are analyzed for *Enterococcus*, the recommended EPA indicator bacteria for Marine Recreational Waters. However, limitations have been found in the accuracy of its use for this purpose. Enterococcus have been shown to multiply outside of the human body, and it is also found in fecal matter of various wildlife (such as feral pigs) in Hawaii. Also, there is a consensus that enterococci is one of the fecal indicators that can “multiply and persist in soil, sediment, and water in some tropical/subtropical environments (Hawaii, Guam, Puerto Rico, south Florida)”<sup>3</sup>. Rain storm or high surf events raises the enterococci levels along the coastal areas and is not a result of human fecal contamination. In view of this, EPA has allowed Hawaii to use *Clostridium perfringens* in conjunction as a secondary tracer.

Dr. Roger Fujioka, a Microbiologist with the University of Hawaii has also found through studies in Hawaii from the early 1970’s to present that:

First, all streams on Oahu routinely exceed the recreational water quality standards and therefore it is not possible to determine when streams are contaminated with sewage when EPA-recommended standards are applied. Second, the primary source of the high concentrations of fecal indicator bacteria in streams was identified as environmental (soil) and did not reflect sewage contamination. In this regard, coastal waters that receive stream and storm drain runoff often exceeded the recreational water quality standards. Third, evidence was obtained to show that fecal indicator bacteria (*E. coli*, fecal coliform, enterococci) are able to multiply in the soil environment of Hawaii. Fourth, monitoring streams and coastal waters for *C. perfringens* provided reliable data to determine when sewage contamination had occurred. Moreover, alternative recreational water quality

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<sup>3</sup> Fujioka, R.S., and Byappanahalli, M. 2004. The Tropical Indicator Water Quality Workshop Report, University of Hawaii, Water Resources Research Center, SR-2004-01: pg 64.

standards were established for *C. perfringens* based on exceeding ambient levels and demonstrating presence of sewage in these waters. These standards have been used to make decisions on closing and opening beaches.<sup>4</sup>

### **Chemical Sampling**

The coastal and offshore chemistry monitoring program is designed to monitor conditions in the marine environment, while compiling a database from which a baseline can be established. As mentioned above, both programs were curtailed indefinitely, due to personnel and resource limitations, a focus on supporting stream chemistry monitoring and watershed assessments, and an increase in the frequency of shoreline sampling due to the inception of the BEACH program. Renewal of the offshore sampling is projected to occur within the next cycle. Regular shoreline chemistry sampling is projected to resume in late 2006. Special shoreline chemistry sampling was performed to a limited extent in the Ke'ehi Lagoon area in late 2005-early 2006.

### **Laboratory Analytical Support**

The DOH employed the use of two Hawaii-based laboratories for analysis of samples, the State DOH Laboratory, and the Natural Energy Laboratory of Hawaii (NELH). The Environmental Health Analytical Services Branch, Chemistry Section is responsible for the analysis of the samples collected by DOH personnel. The two basic types of samples, microbiological and chemical, are each handled by separate sections within the Chemistry Branch of the Laboratory Division. NELH was utilized on a limited basis for microbiology sampling for West Hawaii. Each of the four largest islands, Kauai, Oahu, Maui and Hawaii, has its own microbiology laboratory which conducts the analysis for their respective islands. Only the Oahu laboratory is currently capable of conducting chemical analyses; samples from the other islands are air-shipped to the Oahu laboratory.

### **Quality Assurance/Quality Control**

The monitoring program quality assurance/quality control is governed by the Quality Assurance Project Plan (QAPP), a comprehensive document which covers all aspects of the program. Currently, it has been rewritten and is in the final stages of approval. Two newly created positions within DOH will manage the QA/QC responsibilities. The Environmental Management Division will fill a division-wide QA/QC position in State FY07, while CWB had created and filled a new QA/QC position in early 2004.

### **Data Storage, Management and Sharing**

The main repository for monitoring data is EPA's STORage and RETrieval (STORET) system. All post 1999 sampling data obtained from the Clean Water Branch's fixed network of routine monitoring stations is first compiled into a CWB Access database, then entered, or will be entered into EPA's STORET system. Data prior to 1999 is stored in the "Legacy STORET Database". Monitoring data will continue to be entered into STORET via the DATASTOR program created specifically for this purpose by the EPA Region IX STORET coordinator. It is

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<sup>4</sup> Fujioka, R.S., and Byappanahalli, M. 2004. Addendum to the Tropical Indicator Water Quality Workshop Report, University of Hawaii, Water Resources Research Center, SR-2004-01: 67-68.

anticipated that by 2007 STORET will be replaced by the Water Quality Exchange system (WQX). All existing STORET data will be transferred to WQX, and all future monitoring data will then submitted to WQX. The data is then uploaded to EPA's main database which can be accessed via the internet.

The Clean Water Branch also handles numerous requests for data from students, administrators, teachers, private citizens, consultants and many others, and freely shares its data with all of them. Such requests are filled utilizing the CWB Access database.

Permittee effluent monitoring also generates a significant amount of sampling data. However, the data is only on hard copy, not electronic form. Although the data is accessible, it must be gathered and then compiled by hand before analysis is performed. Hence, only those involved with or concerned about a specific location normally reviews this type of information. CWB staff would like to have this data available as an additional source of information (especially in areas where no other sampling may exist), however, other responsibilities have higher priority (e.g. WBS assessments and the 305(b) report), and therefore, no progress has been made in inputting this data into STORET.

## **C.2. Assessment Methodology**

### **Data Sources**

A formal call for marine data was made in October 2005. All data was used with the exception of two sources. The list below details each.

#### **ENVIRONMENTAL ASSESSMENT COMPANY.**

EAC is a private research company headed by Richard Brock, PhD. An extensive data set was provided by Dr. Brock for the south-south-eastern coast of Lanai, and the Kona (western) coast of the Big Island (Hawaii). All data was produced following a prepared methodology, complying with the "West Hawaii Coastal Monitoring Program Monitoring Protocol Guidelines" (May, 1992). Laboratory analysis follows Standard Methods (1999).

#### **MARINE RESEARCH CONSULTANTS**

MRC is a private research company headed by Steve Dollar, PhD. The ongoing research was prepared for the Makena Resort Corp. to characterize coastal water quality (specifically targeting parameters set forth in HAR 11-54), in Makena, Maui. An extensive data set was provided, following prepared sampling methodology, documented analysis methodology (Strickland and Parsons 1968, Grasshoff 1983), and utilizing EPA rated laboratories (Marine Analytical Specialists). A data set was also provided for the Ewa (south-west) area of Oahu, focusing on the coastal areas near the Ocean Pointe Development.

#### **CLEAN WATER BRANCH**

With continued funding from EPA's BEACH program, the existing bacteriological shoreline program was able to greatly expand both the number of sites and samples taken. The microbiological dataset extends from 1973 to present, however past reports have only included data from the previous 3 years, due to pollutant levels at sampling stations remaining fairly stable over time. This report maintains this methodology. The Monitoring Section provided a

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bacteriological data set of 10,114 samples for 4 of the main Hawaiian islands. The data was collected following the CWB QAPP. The data is routinely checked by the QA/QC officer.

### HANALEI WATERSHED HUI

In 2005, CWB began a cooperative bacteriological sampling program with the Hanalei Watershed Hui, in which the Hui would collect samples at several of the northern Kauai stations. However, due to inconsistencies in secondary checks (a QA/QC method requested by DOH), the data was deemed unusable. The data may be included in the next cycle.

### GACCI-FM

Data was submitted from this company for sampling performed at the Kauai Lagoon Resort site, located on the south-eastern Kauai, from October 2004 to January 2005. The sampled water body is a man-made lagoon, and is not considered to be a marine or estuarine water, therefore the dataset was not used.

### Assessment Methodology

The EPA/DOH agreement requires a reassessment of those areas where sampling had been conducted in the two-year period. Since these water bodies had been evaluated previously, the existing records were updated with the current information. Assessments were conducted for those water bodies for which sampling data was available in the 2003 to 2005 time period. When necessary, and if data was available, data from previous years were also utilized. The assessments performed for this document by EPO and CWB staff, followed the Assessment Guidance document (July 2005) to the maximum extent practicable.

Hawaii Administrative Rules (HAR) 11-54, sets *general* use classifications which establish a classification framework for both fresh and marine waters. They do not, however, contain specific “definitions of designated use” unlike many other states. This issue is currently being discussed at the state level, and it is hoped that future revisions of 11-54 will address the lack of definitions.

For this cycle, the multi-categorization method has been employed, yielding a better categorical description of each water. However, since the previous cycle employed a single category listing method, a 2004 listing labeled with one category may now be listed with multiple categories. Table 4 documents changes between the two reports, and the justifications for doing so.

The five categories that are prescribed by EPA for application to each state’s water bodies are listed below. The guidance document itself can be accessed at the following web site: <http://www.epa.gov/owow/tmdl/2006IRG/#documents>. Figure 1 shows the steps taken as a flow chart. Waters must be placed into the following categories following assessment:

- Category 1:** All designated uses are supported, no use is threatened;
- Category 2:** Available data and/or information indicate that some, but not all of the designated uses are supported.
- Category 3:** There is insufficient available data and/or information to make a use support determinations.
- Category 4:** Available data and/or information indicate that at least one designated use is not being supported or is threatened, but a TMDL is not needed.

- 4a.** A TMDL to address a specific segment/pollutant combination has been approved or established by EPA.
- 4b.** A use impairment caused by a pollutant is being addressed by the state through other pollution control requirements.
- 4c.** A use is impaired, but the impairment is not caused by a pollutant.

**Category 5:** Available data and/or information indicate that at least one designated use is not being supported or is threatened, and a TMDL is needed.

### **Assessment Utilizing Hawaii Water Quality Standards**

The HRS Chapter 11-54 defines the state standards for particular parameters for Hawaii waters, and is defined by both narrative and numerical criteria. §11-54-1.1 defines a general policy of water quality anti-degradation for all water types and is as follows:

- (a) Existing uses and the level of water quality necessary to protect the existing uses shall be maintained and protected.
- (b) Where the quality of fish, shellfish, and wildlife and recreation in and on the water, that quality shall be maintained and protected unless the director finds, after full satisfaction of the intergovernmental coordination and public participation provisions of the state's continuing planning process, that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located. In allowing such degradation or lower water quality, the director shall assure water quality adequate to protect existing uses fully. Further, the director shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable best management practices for nonpoint source control.
- (c) Where high quality waters constitute an outstanding national resource, such as waters of national and state parks, and wildlife refuges and waters of exceptional recreational or ecological significance, that water quality shall be maintained and protected.

HRS §11-54-3(c) defines classifications for marine water uses. The classification uses a tiered system, defining two Classes, "AA" and "A", with class A waters containing subclasses. Class AA water uses are described as: "It is the objective of class AA waters that these waters remain in their natural pristine state as nearly as possible with an absolute minimum of pollution or alteration of water quality from any human-caused source or actions. To the extent practicable, the wilderness character of these areas shall be protected." Two subsections define specific criteria for areas of defined characteristics. Class A water uses are described as: "It is the objective of class A waters that their use for recreational purposes and aesthetic enjoyment be permitted as long as it is compatible with the protection and propagation of fish, shellfish, and wildlife, and with recreation in and on these waters." In addition, the section addresses discharges, and sets specific criteria within three subsections, HRS §11-54-3(c) 2(A), (B), and (C).

These standards are further refined by inclusion of a wet and dry season, typically defined via rainfall levels. Also, the water bodies are separated by type into 5 main water body categories: stream, estuary, embayment, open coastal, and oceanic. The embayment classification contains specified locations and the criteria used to identify them. Embayments are defined as "...land-confined and physically-protected marine waters with restricted openings to open coastal waters,

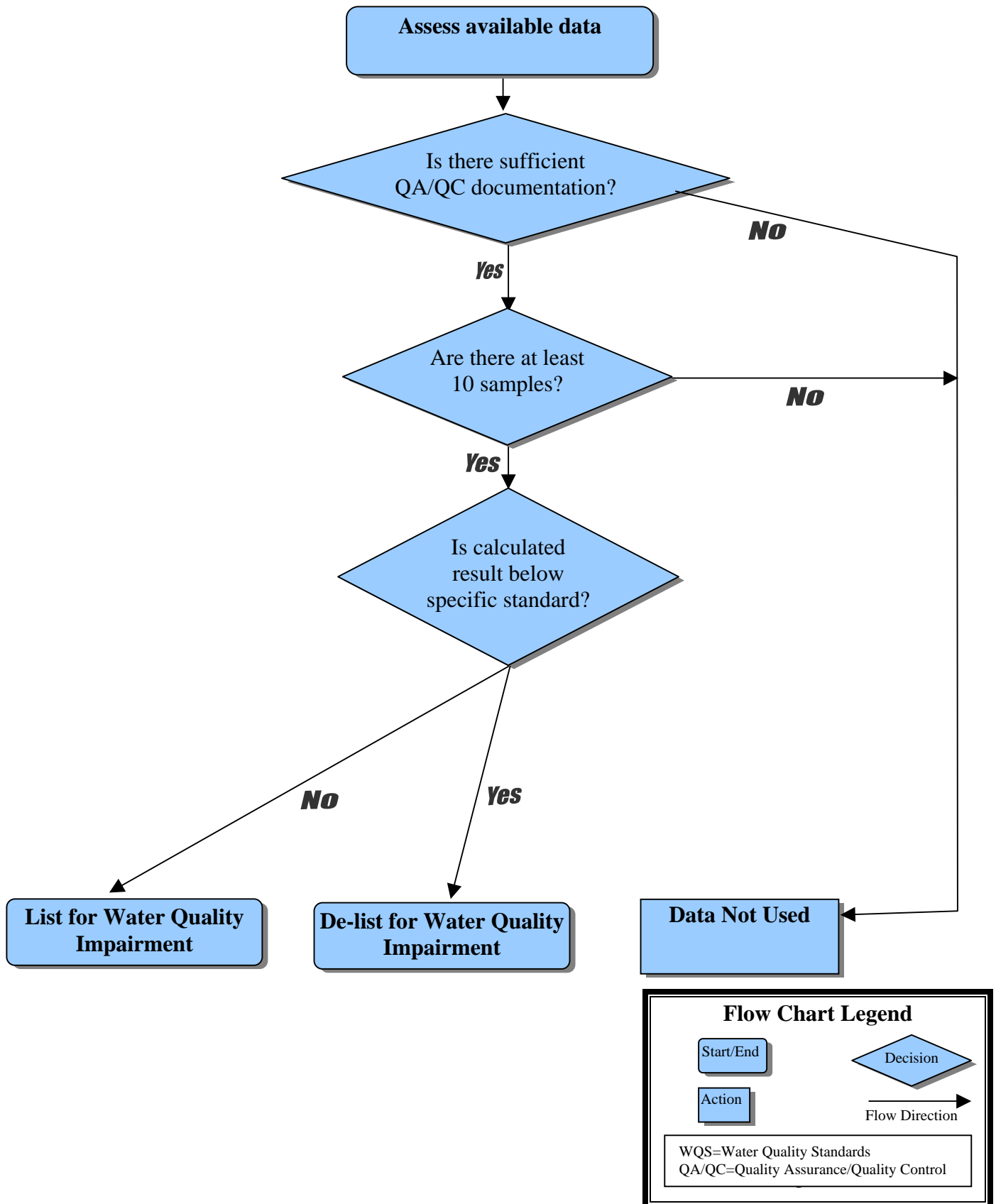
defined by the ratio of total bay volume to the cross-sectional entrance area of seven hundred to one or greater.” (HRS 11-54-6a(1)). Although the standards define this ratio, it does not specify the exact location of the “entrance” of each embayment to which the formula was applied. For purposes of this report, delineations of embayments were made using best personal judgement, and primarily drawn from the nearest land “point” (usually a named point, such as Palea and Pai’olu’olu points for Hanauma Bay) that forms the mouth of each.

Stream categories are further broken into sub-categories. Two special area categories, Pearl Harbor, and Kona (west Hawaii) are defined for salt waters. Each category establishes specific standards for their respective water type. In addition, defined limits are placed upon the application of the standard for enterococci. As stated by HRS 11-54, the standard is applicable “within 300 meters (one thousand feet) of the shoreline, including natural public bathing or wading areas”. Therefore, all listings in IR List are applicable only out to the stated boundary. Assessments of water bodies for this report adhere to these outlined definitions. Available assessment data was compiled using the defined methodology (geometric mean), and compared to each applicable standard. Each water body was categorized according to comparison with each particular standard. A more detailed description of the standards is available in the attached copy of this document as an appendix. It also can be accessed at the following website: <http://www.hawaii.gov/health/about/rules/11-54.pdf>.

Assessment of microbiological data employed the use of a secondary indicator. As previously mentioned, there are limitations on the use of *Enterococcus* as an indicator of human fecal contamination in Hawaii’s tropical waters. In response to this, in addition to *Enterococcus*, the densities of *Clostridium perfringens* bacteria are also monitored. The use of *Clostridium perfringens* provides a better indicator due to its association with human fecal contamination. An exceedance of the *Enterococcus* standard is evaluated with that of the *Clostridium perfringens* guideline for inclusion as impairment.

**FIGURE 1: Flow Chart of Listing/De-listing Process  
for Conventional Pollutants**

(enterococci, TN, NO<sub>3</sub>+NO<sub>2</sub>, TP, turbidity, chl-a, NH<sub>4</sub>, others)





### **Changes to Assessment Methodology**

Modifications to the assessment units were instituted for the 2006 reporting cycle. With each ensuing cycle, it is encouraged that state's assessment units be refined to improve characterization of their waters. For the 2004 cycle, the units were comprised of individual monitoring stations. For 2006, assessment units are based upon defined named areas. The units maintain the focus on same monitoring stations; however they differ in that the represented area has been expanded to the named beach that the station resides within. For example, a 2004 listing shows a geographic scope of "Gray's Beach station [Halekulani]". For 2006, the geographic scope is now listed as the named area of "Gray's Beach", where the "Gray's Beach station [Halekulani]" is encapsulated within that area. This is justifiable since past monitoring has indicated similar sampling results from adjacent sampling stations at coastal areas, except in cases of inflow from point sources or streams. In addition, the use of the new assessment areas improves characterization of the geographic scope, and 3 other areas of importance. First, it defines areas for assessment that were not named in previous cycles, allowing for increased monitoring coverage and assessment. Second, the units are closely related to human use, which allows for improved monitoring and assessment in areas where the public has greatest concerns. Third, the new units utilize publicly familiar names, which will potentially improve relevance and comprehension of this report.

With the 2006 cycle, CWB will also move closer towards the EPA desired "Watershed Approach" to water quality assessment. Hawaii's topographical structure is comprised of generally short, small watersheds defined by steep mountain walls. Input of fresh waters into the fronting coastal waters is generally limited to the specific watershed that feeds those streams. In IR List, the first column contains the names of the watersheds that feed the coastal water bodies that are listed. This aids in relating both the inland waters and the coastal waters. In future cycles it is hoped to organize listings for both inland and coastal waters by watersheds. It is hoped that the restructuring of the assessment units may provide a more seamless integration of both water-types. An existing watershed GIS layer developed by the Office of State Planning was used for delineation. The layer can be found along with metadata at the following website:  
<http://www.hawaii.gov/dbedt/gis/download.htm>.

Two boundaries are defined by HRS 11-54 to guide the application of the water quality standards: 1) a 1000' or 300m boundary and, 2) a 100 fathom depth contour boundary. The first boundary defines the marine recreational waters where the state enterococcus standard is applied "[w]ithin 300 meters (one thousand feet) of the shoreline, including natural public bathing or wading areas..." (HRS 11-54-8(b)1). The second boundary defines the open coastal waters, and is the "...marine waters bounded by the 183 meter or 600 foot (100 fathom) depth contour and the shoreline..." (HRS 11-54-6.3(b)1).

There are difficulties in combining the boundary guidelines of HRS 11-54, and defined boundary limits for coastal areas. Each island's shoreline is formed by the natural process of erosion, and as a result, instead of a smooth circular coastline, there are myriad angles at which the sea meets the shore. Because of this, if defined shoreline boundaries (e.g., a defined beach area) are extended seaward, intersections of these boundary lines are difficult to avoid and do not result in easily defined segments. In addition, by definition in the rule, several other boundaries are also involved with the Class A and Class AA marine waters (HRS 11-54-3(c)). Waters that fall within marine and wildlife sanctuaries,

and waters that are specified unique or critical habitats for threatened or endangered species as specified by the U.S. Fish and Wildlife Service are also included (HRS 11-54-6 (a-b)).

This report represents the first phase in creating a comprehensive, coherent interpretation of all pertinent assimilated guidelines. The boundary definitions used in the report utilizes the demarcated areas of the State Water Quality Maps (Class A and AA) as a guide, but does not adhere to them exactly. Since each island is unique, the boundaries for each island were delineated individually following a set of general guidelines. Where unique features of a particular island were encountered more detail was added to the delineation. Guiding principles included (but were not limited to) the following factors:

1. Historic and existing boundary delineations.
2. Coastal and marine geographic setting.
3. Watershed characteristics and coastal impacts.
4. Overlapping inter-island boundaries (quadrants and designated uses, e.g. Class AA, Whale Sanctuaries, NWHI).
5. Distance from shoreline to 100 fathom depth.

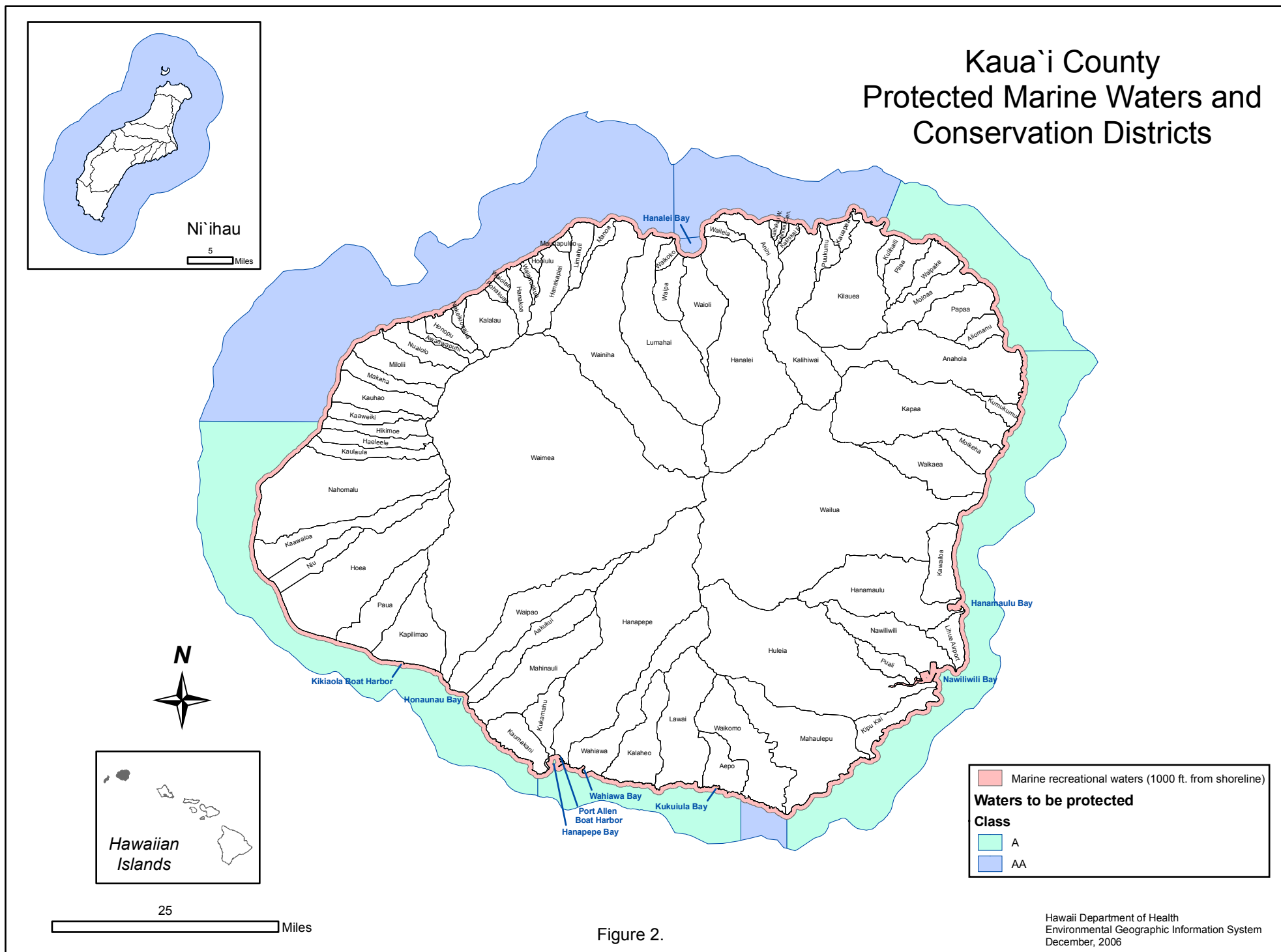
The resultant demarcations (figures 2 through 5) are the first phase in establishing these areas, however additional analysis on areas of overlap, and ambiguity must be performed before further decisions are made. Ensuing cycles will incorporate improvements upon completion. For current reporting purposes the focus will remain on the major units.

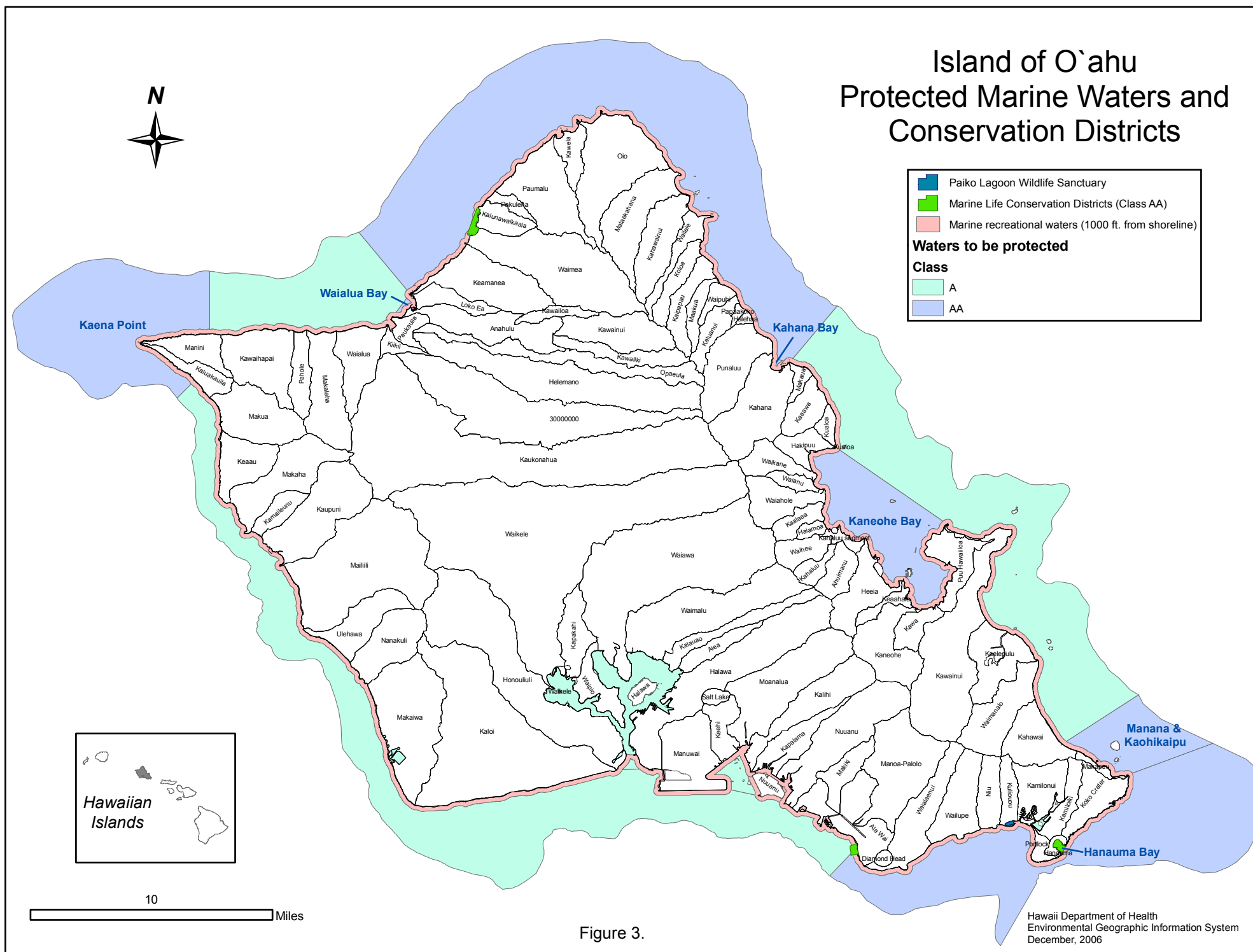
Figures 2, 3, 4 and 5 show the delineated areas that represent the assimilated boundary data for the 7 main Hawaiian islands. For this cycle, the complete inventory of marine waters assessment decision units is too complex and detailed to be fully captured in report-size pages (8.5x11 or 11x17). As a result, not all defined areas are displayed in the figures.

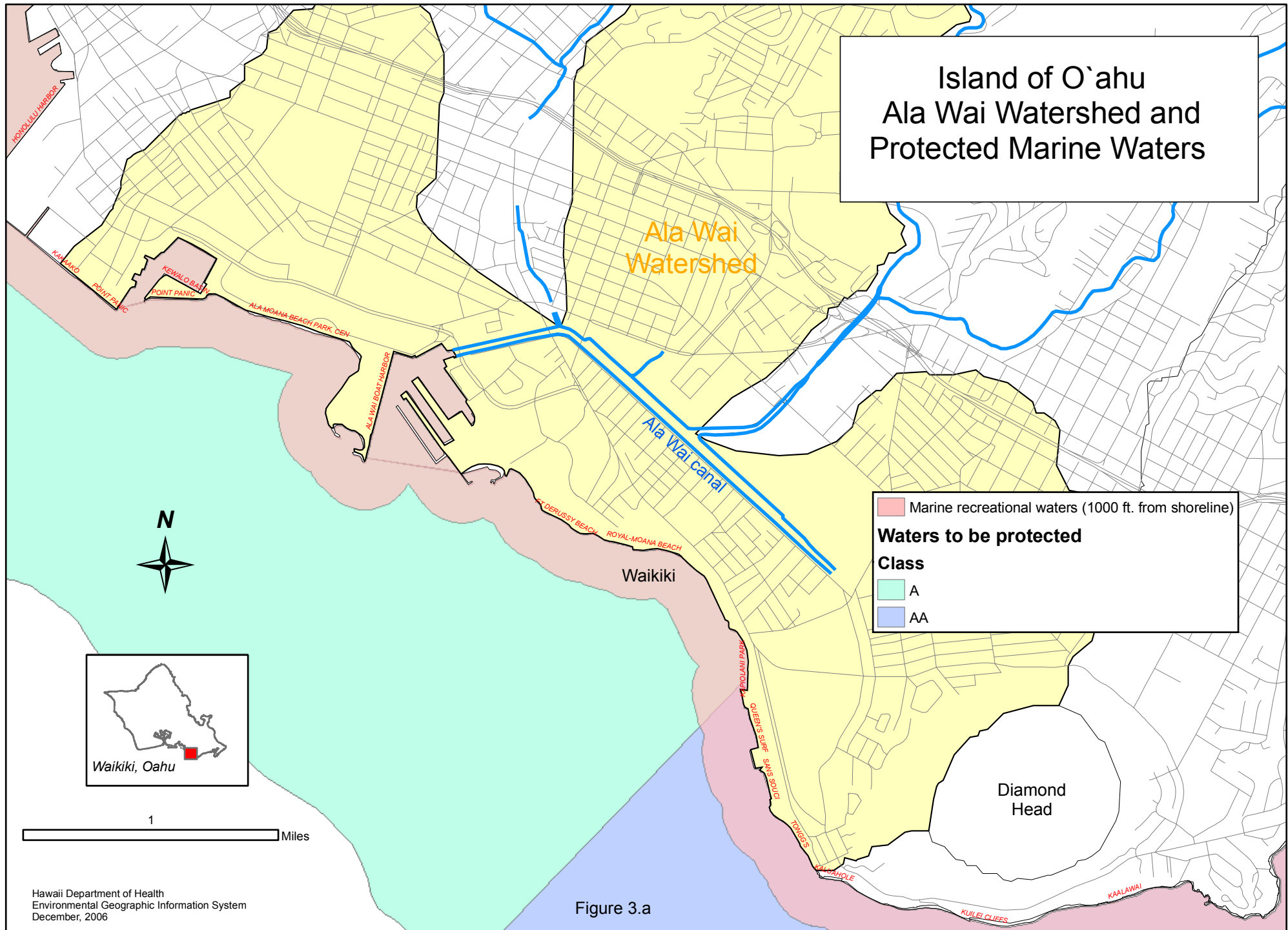
Figure 3a displays a larger scale view of a portion of the Oahu coastline, and the 300m (1000') marine recreational water boundary line. This figure illustrates how a watershed is composed of a number of individual segments, or assessment units. Each named segment corresponds to an identification alphanumeric geocode (e.g. Royal-Moana Beach is geocode HI898947) and both are used to identify the segments in Tables 1-8. A discussion on the geocodes can be found in the following section, Assessment Codes.

For this cycle (for enterococci), in the instances where new areas contain 2 or more sampling stations, the area is segmented to the corresponding number of stations rather than combining the data. This method was chosen due to the stipulated (HRS 11-54) use of a geometric mean used for a defined number of samples (>5). A geometric mean is temporally sensitive; therefore the last 5 consecutive samples of an area must be used in the calculations. However, because frequency of sampling varies between stations (due to a rotating schedule of areas), it is possible that an overrepresentation of a station may occur, skewing the data to the conditions of that particular area. Segmenting the area maintains the integrity of the data for each station, and keeps within the mandates of HRS 11-54.

The use of visual assessments was not used for the 2006 cycle. Unlike previous cycles, visual assessment data was not available for 2006. Listings from previous cycles based on legacy visual







# Maui County Protected Marine Waters and Conservation Districts

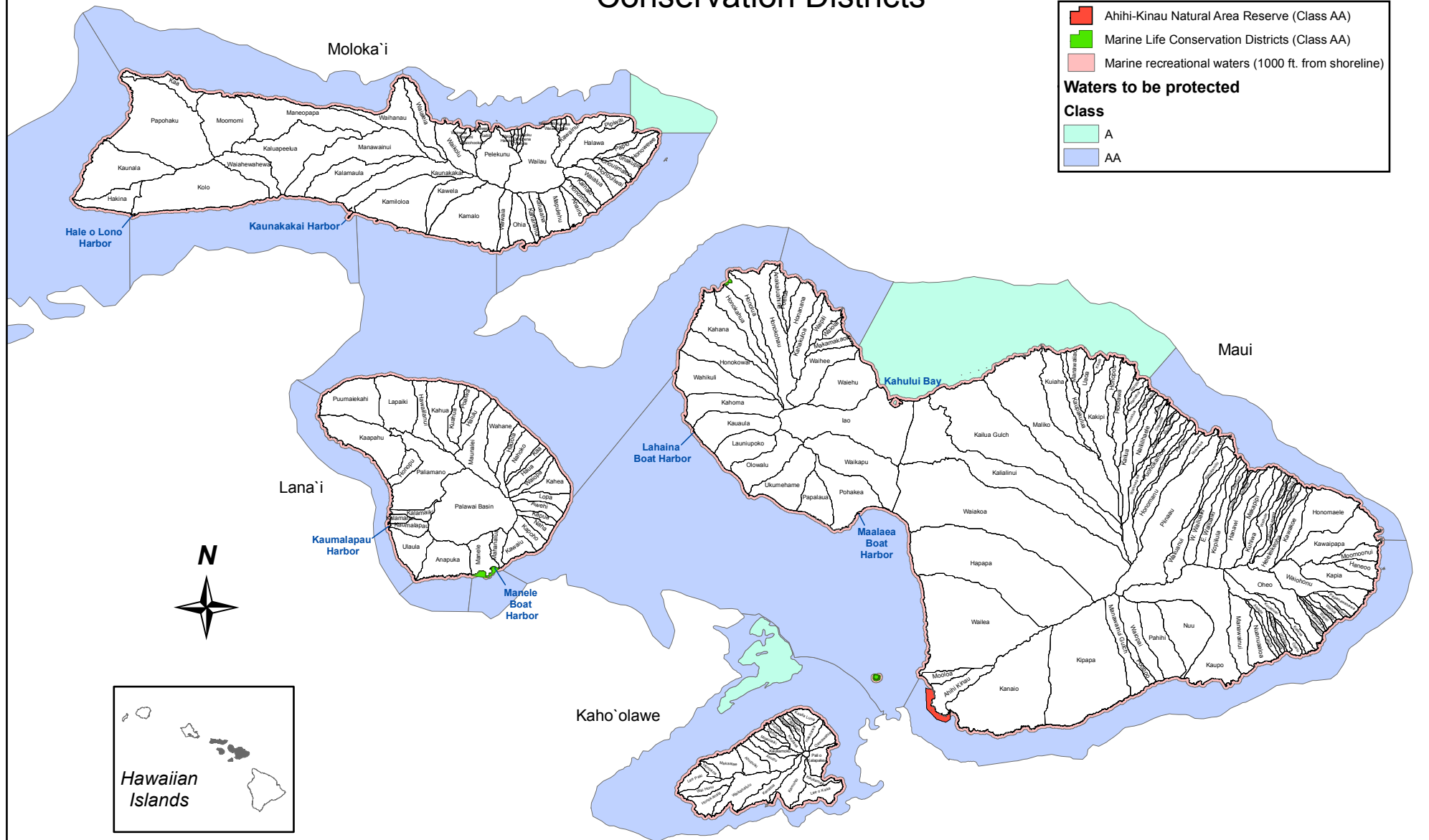


Figure 4.

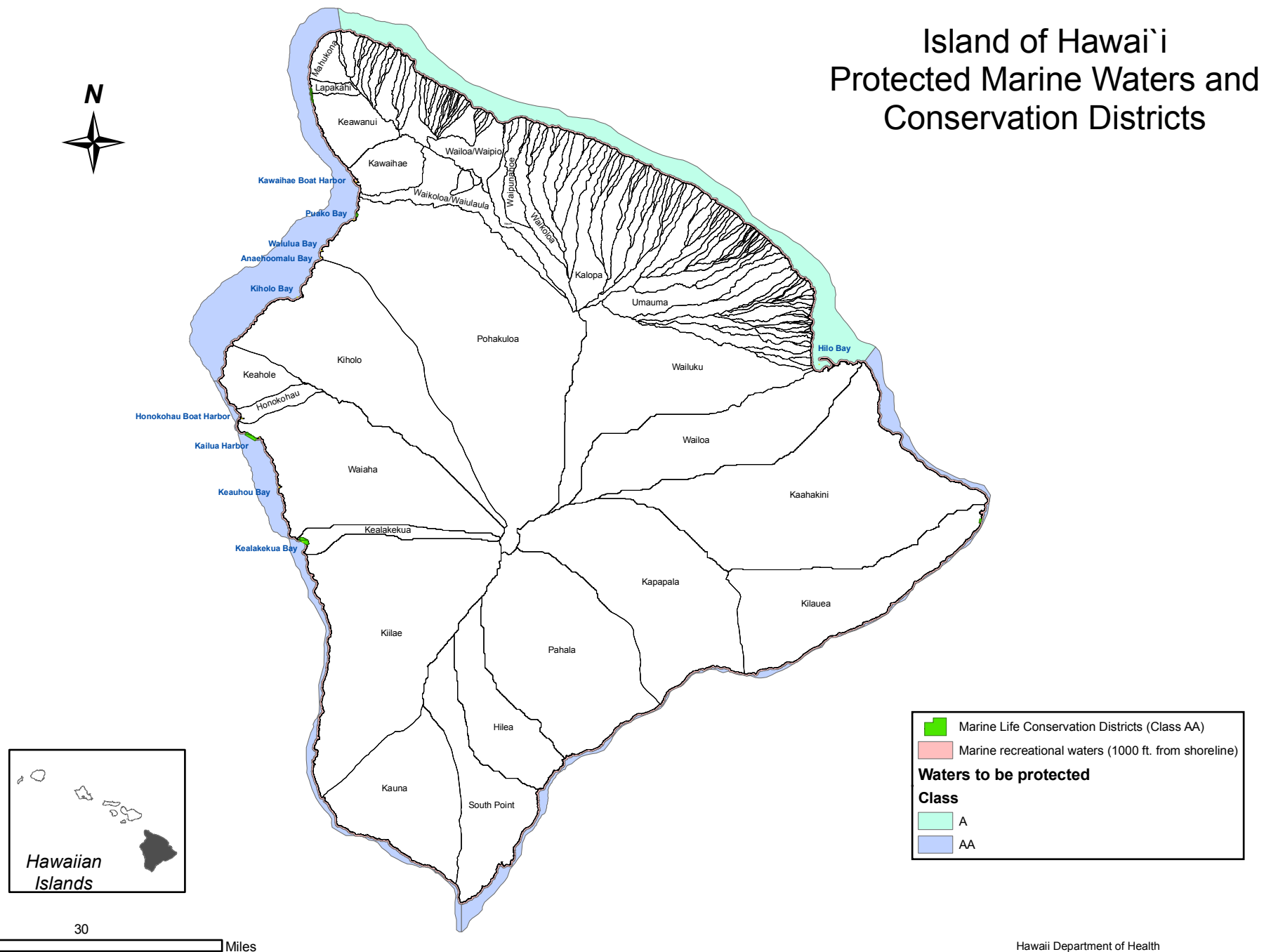


Figure 5.



assessments have been carried over to the present listing. An example is the carry-over of the 2004 nutrient and turbidity listing for the geographic scope of “Kahului Bay inshore of breakwater”. In future cycles it is possible that this data will be revisited and/or reassessed.

### Assessment Codes (Geocodes)

For the 2006 report, an alphanumeric code (geocode) was assigned to each marine water body. This code differs from previous reports which identified sampling areas via the DOH STORET sampling station number. Two sets of geocodes exist in the Hawaii structure, a 2 letter alphanumeric (HI), and a 3 letter alphanumeric (HIW). The numeric portion of both geocodes is preceded by the state abbreviation (HI) as suggested by EPA protocol. The 2 letter geocode is from an existing structure from the EPA BEACH program that identifies recreational waters across the state. Use of this code greatly streamlines compilation of data for future reports by utilizing matching codes and names, and improves compatibility between two programs that utilize similar data. The 3 letter code was generated in response to areas where BEACH codes do not exist, for example, legacy listings (e.g. South Molokai Coast Near shore waters to 18’ from southwest point – Waialua), and areas that are divided into smaller subsections (e.g. Kahana Bay which has 3 sections). Each code is comprised of a total of 8 characters, and is not ordered (due to the random generation process of BEACH codes).

### C.3. Assessment Results

**TABLE 1. Category Totals by Island**

Island	Total Assessed	2,3	2,3,5	3,5	3	2	Newly Listed Waters	Newly Listed Pollutant	Total 5 (“3,5” + “2,3,5”)	Total 2 (“2,3” + “2,3,5”)	De-listed Waters
Kauai	38	9	1	28	47	0	3	1	29	10	0
Oahu	98	24	13	62	81	0	14	1	73	37	2
Molokai	3	0	0	3	35	0	0	0	3	0	0
Lanai	8	2	6	0	10	0	8	0	6	8	0
Maui	76	2	20	54	48	0	6	3	74	22	0
Hawaii	47	14	18	15	42	0	13	1	33	32	0
<b>Totals</b>	<b>270</b>	<b>51</b>	<b>58</b>	<b>162</b>	<b>263</b>	<b>0</b>	<b>44</b>	<b>6</b>	<b>219</b>	<b>109</b>	<b>2</b>

The above table summarizes the results of the assessments. In total, there were 534 water bodies, of which 270 (51%) had available data for assessment (Kauai 45%, Oahu 54%, Molokai 8%, Lanai 44%, Maui 61%, Hawaii 53%). A total of 2 water bodies were de-listed for previously listed pollutants: Lanikai Beach for enterococci, and Waimanalo Beach County Park also for enterococci. Assessment results for both beaches showed that state standards were attained for enterococci, using the enterococci and *Clostridium perfringens* indicator bacteria as mentioned earlier in this document. No single category “2” was assigned to any water body, due to occurrences of category “3” (unknown, or no data) in at least one pollutant. A total of 44 new water bodies were listed with at least one category “5”, and a total of 6 previously listed water bodies had a pollutant added to category “5”. The following tables list the newly listed waters for each island, and the parameters for which they are listed.



Table 2 displays the total of 3 newly listed waters for the island of Kauai. Hanalei Bay Waioli Beach (HIW00091), Lydgate Park (HI798758), and Waipouli Beach (HI682678). Assessments for all three water bodies showed that state standards were not attained for enterococci, using the enterococci and *Clostridium perfringens* indicator bacteria.

**TABLE 2. Newly Listed Coastal Waters: Kauai**

Kauai							
Geo scope	ASSESS ID	Entero	TN	NO3+NO2	TP	TURB	other
Hanalei Bay	HIW00091	N	?	?	?	?	
Lydgate Park	HI798758	N	?	?	?	?	
Waipouli Beach	HI682678	N	?	?	?	?	

Key: Entero=enterococci; TN=total nitrogen; NO3+NO2=nitrate+nitrite nitrogen; TP=total phosphate; TURB=turbidity; chl-a=chlorophyll a; NH4=ammonium nitrogen.

Table 3 displays the total of 14 newly listed waters for the island of Oahu. Sampling results for Ocean Pointe (HIW00129, HIW00130, and HIW00131) showed the water bodies did not attain state standards for total nitrogen, nitrate + nitrite, and ammonium, while attaining standards for total phosphorus, and chlorophyll a. Sampling results for Ocean Pointe (HIW00132) showed the water bodies did not attain state standards for total nitrogen, nitrate + nitrite, ammonium, and chlorophyll a, while attaining standards for total phosphorus. The remaining 10 listings were due to assessments indicating that state standards were not attained for enterococci, using the enterococci and *Clostridium perfringens* indicator bacteria.

**TABLE 3. Newly Listed Coastal Waters: Oahu**

Oahu							
Geo scope	ASSESS ID	Entero	TN	NO3+NO2	TP	TURB	other
Ocean Pointe	HIW00129	?	N	N	A	N	chl-a(A), NH4(N)
Ocean Pointe	HIW00130	?	N	N	A	N	chl-a(A), NH4(N)
Ocean Pointe	HIW00131	?	N	N	A	N	chl-a(A), NH4(N)
Ocean Pointe	HIW00132	?	N	N	A	N	chl-a(N), NH4(N)
Kaaawa Beach Park	HI580360	N	?	?	?	?	
Kahana Park	HIW00103	N	?	?	?	?	
Kahanamoku Beach	HI366432	N	?	?	?	?	
Kawaiku'i Beach Park	HI304424	N	?	?	?	?	
Keehi Lagoon	HIW00009	N	?	?	?	?	
Pokai Bay	HIW00007	N	?	?	?	?	
Punaluu Beach Park	HI148836	N	?	?	?	?	
Royal-Moana Beach	HI898947	N	?	?	?	?	
Waimanalo Bay St. Rec. Area	HIW00008	N	?	?	?	?	
Waimea Bay	HIW00128	N	?	?	?	?	

Table 4 displays a total of 6 newly listed water bodies listed for the island of Lanai. Assessment results indicated that standards were attained for TN and TP for all 8 sites. Assessment results showed that turbidity standards were not attained at Awehi (HIW00134), Manele Boat Harbor (HIW00179), Kahemano Beach (HI801428), and Mahanalua (HIW00136). Assessment results indicated that standards were not attained for chl-a only at Manele Boat Harbor (HIW00179). Lastly, assessment results indicated that standards for NH4 were only attained at Hulupoe Bay (HIW00177), and Manele Bay Beach (HIW00178).

**TABLE 4. Newly Listed Coastal Waters: Lanai**

Lanai							
Geo scope	ASSESS ID	Entero	TN	NO3+NO2	TP	TURB	other
Awehi	HIW00134	?	A	A	A	N	chl-a(A), NH4(N)
Hulupoe Bay	HIW00177	?	A	A	A	A	chl-a(A), NH4(A)
Manele Bay Beach	HIW00178	?	A	A	A	A	chl-a(A), NH4(A)
Manele Boat Harbor	HIW00179	?	A	N	A	N	chl-a(N), NH4(N)
Kahemano Beach	HI801428	?	A	A	A	N	chl-a(A), NH4(N)
Kaluakoi Point to Huawai Bay	HIW00135	?	A	A	A	A	chl-a(A), NH4(N)
Kawaiu Gulch-Makole Pt.	HIW00133	?	A	A	A	A	chl-a(A), NH4(N)
Mahanalua	HIW00136	?	A	A	A	N	chl-a(A), NH4(N)

Table 5 displays a total of 6 newly listed water bodies listed for the island of Maui. Assessment results indicated that state standards were attained for TP at 4 of the 6 sites, Honokowai Pt. to Kaanapali (HIW00139), Mala Wharf area (HIW00138), Oneuli Beach (HI756040), and Poolenalena-Makena Landing (HIW00143). Honokowai Pt. to Kaanapali (HIW00139) also attained state standards for NO3+NO2, turbidity, and chl-a. Microbiological sampling data was not available at these sites.

**TABLE 5. Newly Listed Coastal Waters: Maui**

Maui							
Geo scope	ASSESS ID	Entero	TN	NO3+NO2	TP	TURB	other
Honokowai Pt. to Kaanapali	HIW00139	?	N	A	A	A	chl-a(A), NH4(N)
Mala Wharf area	HIW00138	?	N	N	A	N	chl-a(N), NH4(N)
Oneloa Beach (Big Beach)-Ahihi-Kinau	HIW00144	?	N	N	N	N	chl-a(N), NH4(N)
Oneuli Beach	HI756040	?	N	N	A	N	chl-a(N), NH4(N)
Poolenalena-Makena Landing	HIW00143	?	N	N	A	N	chl-a(N), NH4(N)
Makena Landing-Maluaka Beach	HIW00142	?	N	N	N	N	chl-a(N), NH4(N)

Table 6 displays a total of 13 newly listed water bodies listed for the island of Hawaii. Assessment results indicated that state standards were not attained for TN at all sites. All other assessment results indicated mixed results. Assessment results indicated that 8 of 13 sites attained state standards for Nitrate + nitrite, 9 of 13 sites attained state standards for total phosphate, 4 of 13 sites attained state standards for turbidity, 12 of 13 sites attained state standards for chlorophyll a, and 8 of 13 sites attained state standards for ammonium.

**TABLE 6. Newly Listed Coastal Waters: Hawaii**

Hawaii							
Geo scope	ASSESS ID	Entero	TN	NO3+NO2	TP	TURB	other
Honokohau Beach	HI315174	?	N	N	A	A	chl-a(A), NH4(A)
Kahoiawa Bay	HIW00150	?	N	A	A	N	chl-a(A), NH4(A)
Kahoiawa Bay-Makalawena	HIW00151	?	N	A	A	N	chl-a(A), NH4(A)
Kakapa Bay	HIW00152	?	N	A	A	N	chl-a(A), NH4(A)
Kealakekua Bay	HIW00149	?	N	N	N	N	chl-a(A), NH4(A)
Kahuwai Bay-Mano Pt.	HIW00153	?	N	A	A	A	chl-a(A), NH4(A)
Kuki'o Bay	HIW00154	?	N	N	N	N	chl-a(A), NH4(N)
Manini'owali	HI720408	?	N	A	A	N	chl-a(A), NH4(A)
Paaao Point to Keaweakaheka Point	HIW00145	?	N	A	A	N	chl-a(A), NH4(A)
Pine Trees	HI320616	?	N	A	A	A	chl-a(A), NH4(A)
Pine Trees-Honokohau	HIW00146	?	N	N	N	A	chl-a(N), NH4(N)
Waiulua Bay to Anaehoomalu Bay	HIW00148	?	N	N	N	N	chl-a(A), NH4(N)
Wawaloli Beach-Pine Trees	HIW00147	?	N	A	A	N	chl-a(A), NH4(A)

The following two tables are provided to display the results of the assessments, and any changes that have occurred since the previous listing period. Table 7 lists any changes that have occurred to the 2004 listing of coastal/estuary waters. The first column is entitled Geographic Scope of Listing, and contains the specific area that the assessment applies to. The second column is entitled Assessment ID and contains the geocode for the water body. Column 3 contains the listing category as assigned in 2004, and column 4 contains the pollutants that the listing (if impaired) was for. Column 5 contains the 2006 category utilizing the multi-category method. Column 6 contains the pollutants that have an action associated with them (e.g. data from sampling activities). The last column contains a description of the changes between the two cycles, and justifications for each action. Two codes are used for reoccurring descriptions and justifications in Column 7. This was done to improve readability within the table by alleviating clutter.

Assessment results for each water body were coded according to EPA methods, and placed in IR List. If the calculated level was found to be above the state standard, the parameter was listed as "Not Attaining" (N). If the calculated value was below the stated value, the parameter was listed as

“Attaining” (A). It is important to note that the coastal water bodies listed in the table is not reflective of all coastal areas of the state, rather it is a list of areas where sampling has taken place, and areas of higher incidence of human contact. Areas not listed do not have any sampling data available, and are considered to be in category “3”. Ensuing cycles may add waters as necessary. Parameters where no data was available were listed with a “?”. TMDL Priority rankings for coastal water bodies were matched with the levels assigned to the inland waters for the particular watershed. If the inland waters did not have a ranking, the priority was given a “Low” (L) ranking. This disparity primarily occurred with the enterococci parameter, since no bacteriological data was available for inland waters during this cycle. IR List is described in more detail below.

IR List contains the assessment results of all waters, inland and coastal. Inland waters have been discussed in the first section of this report. The following narrative will only apply to the coastal sections. The first column contains the name of the watershed that fronts the coastal waters. The second column contains the water body type, as distinguished by HRS 11-54. The third column contains the “Scope of Listing”, or the name of the specific area that the assessment applies to. The fourth listing contains the Geocode ID, or assessment ID that is the alphanumeric identifier attached to each listing. Columns 6-11 contain common pollutants found in Hawaii’s waters. Column 11 contains listings of other pollutants that were found with less frequency. The twelfth column contains the category that each water body has been assessed to. As described earlier, the multi-category listing allows for a better description of each water body. For example, a listing that has attains standards in enterococci, TN, NO<sub>3</sub>+NO<sub>2</sub>, but does not attain for TP, and has no data for turbidity will have a listing of “2, 3, 5”, instead of simply “5”.

IR List contains a number of listings that are similar in name to other listings (indicated by an asterisk \*); these are not duplicates. These listings are from previous reporting cycles and were listed at that time as separate entities from similar named sampling stations. An example is the listing for Hanalei Bay at Pavilion station (HIW00158) which is similar in name to Hanalei Bay (Pavilion) (HIW00092). Past rationale has been that different groups gather the samples with different personnel, equipment, protocols, and analytical methods. Because previous cycles have listed the water bodies as separate entities, the listings will not be combined, and will remain listed for this cycle.

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